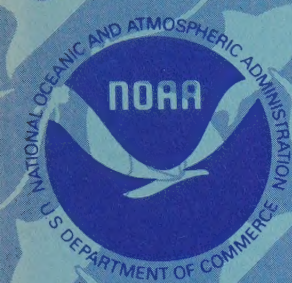


J-81-15



SOUTHWEST FISHERIES CENTER

NATIONAL MARINE FISHERIES SERVICE

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MAY 1981

USER'S MANUAL FOR EVOLVE

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ADMINISTRATIVE REPORT No. LJ-81-15

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1.0 BACKGROUND

EVOLVE is a computer procedure used to stratify data files in which each logical input record consists of a single physical record up to 394 characters long. The primary motivation for creation of this procedure was to meet the need to provide stratified single set data from monitored U.S. purse seine vessel trips as input to the procedure PROJCT, which calculates annual estimates of porpoise mortality using a stratified ratio estimation method. However, EVOLVE is useful to any researcher as a data processing tool to stratify a data file. Stratified data files output by EVOLVE, consisting of fixed length records 400 characters long, can be input to other software packages so long as the user allows for the presence of a stratum number 6 characters long prefixed to each record. See examples in section 10.0.

EVOLVE was originally coded by Susan Boyer in FORTRAN IV for use on the INFONET UNIVAC computer and was later converted for use on the VAX computer by Joe Caruso. The VAX version is presently the only version available. The user may accomplish the desired stratification of a data set in a single execution of EVOLVE or as an iterative process of successive executions of EVOLVE, which might modify previous stratifications or collapse together previously defined strata, as described in section 7.0 of this manual. After each run of EVOLVE the researcher may evaluate the stratification scheme by examining printed strata statistics, including record counts, frequencies, and means and standard deviations of up to three variables over individual records or over clusters of records.

2.0 PROGRAM DESCRIPTION

The key step in achieving stratification of the user's data is the computation of a stratum number identifying a unique stratum to which each record belongs. Computation of strata numbers and other program functions are divided among the three modules described below.

Module 1, performed by the subroutine PLANIT, reads, edits and processes the researcher input parameter records which control program execution, including file processing and program output. See section 5.0 for a description of the parameter records.

The second module, called DOIT, comprises the bulk of EVOLVE, and directs the file processing. File processing entails 1) reading each data record of the input data file, 2) expanding it to 394 characters by padding it with blanks if necessary, 3) computing the number of the stratum which should contain the record based on the values of its stratifying variables, 4) replacing the computed stratum number if that stratum is to be collapsed into another, 5) prefixing the correct stratum number to the expanded record, and finally 6) outputting the prefixed, expanded record to an output data file if none of the record's stratifying variable values were blank or outside of the ranges established by the user. Once the output file is completed, its records are sorted by cluster, if defined, within stratum number.

If the user wishes to evaluate the stratification obtained, module 3 is performed by subroutine VIEWIT. This module reads the output data file just created by module 2, then calculates and outputs two-dimensional strata statistics arrays whose cells contain statistics for a single stratum. To minimize the volume of printed output from VIEWIT, any array containing only empty cells is not printed. Refer to the REORDER parameter description (section 5.12.1) for an explanation of printing format for these strata statistics arrays and to the examples (section 10.0) for sample output from VIEWIT.

3.0 STATISTICS

Record counts and statistics specified in the STATISTICS parameter record will be displayed by stratum so long as the NOPRINT parameter is not included in the parameter records file. Statistics may be computed over individual records (for example, sets) or over clusters of records (for example, cruises comprised of one or more sets). The user may request no statistics, or may request means or standard deviations, or both. Assuming that the NOPRINT option is not specified, record counts only will be displayed even if no statistics are requested; record counts, frequencies and variable means will be printed if means are requested; record counts, frequencies, and variable standard deviations will be output if standard deviations are requested. Both means and standard deviations may be requested in a single run. The record count, denoted as "RECORDS=" on the output, is simply the total number of records. Frequency, output as "N=", is defined as the total number of records or clusters for which none of the variables specified had missing values. That is, if the value of any variable is missing for a record or cluster, that record or cluster is not included in the frequency count, and the values of the non-missing variables for that record or cluster are not included in the statistics calculations either. If N is 0, the standard deviation will be printed as "0"; whereas if N is 1, the standard deviation will be printed as "-1" to alert the user.

If statistics over records are specified, then at least one variable must be defined in the run. If statistics over clusters are requested, then no variables need be defined. A request for statistics over cluster when no variables are specified will result in output of mean numbers of records per cluster or of standard deviation of numbers of records per cluster, or of both.

4.0 FILE DESCRIPTIONS

[Please refer to the System Flow Diagram of section 7.0 as a visual aid to understanding section 4.0.]

4.1 Parameter Records File

This input file contains the parameter records specified by the user to control program execution. See below for a list of the 15 parameter record names. Refer to section 5.0 for a detailed description of their use.

CLUSTER

COLLAPSE

INDATA

NODEFILE

NOGO

NOLIMIT

NOPRINT

OUTDATA

OUTPARAMETERS

PASTPARAMETERS

RANGE

REORDER

STATISTICS BY

STRATA

VARIABLE

4.2 Input Data File

EVOLVE accepts two types of input data files, both named in the INDATA parameter record. If EVOLVE is being executed for the first time on a set of data, it requires as input a raw data file containing records from 1 through 394 characters long. Should EVOLVE be run on the original data set more than once, then the output data file of one run should become the input data file of the next run. In section 10.0, the input data file of example 3 is the output data file of example 2. If the user does not include a PASTPARAMETERS record in the parameter records file, then EVOLVE expects the first type of

input data, namely raw data. If the user does include a PASTPARAMETERS record, then EVOLVE expects its input data file to be in the format of an output data file created by a previous execution of EVOLVE.

4.3 Output Data File

Records from the input data file which are determined to belong to a stratum are output, after slight transformation, to the output data file named in the OUTDATA parameter. The output data file of transformed records is then a subset of the records contained in the input data file. Input records are transformed by first expanding the record to 394 characters and then prefixing the proper six-character stratum or cell number to the expanded record. The first five characters of the cell number are coded values (1, 2, ..., 9) of the stratifying variables. The sixth character is a "C", if the cell contains records from more than one cell which were collapsed into the same cell, or a blank, otherwise. In example 2 of section 10.0, a record from the input data file with values of "1800" for capacity, "2" for geartype and "3" for class would be output to the output data file with a cell number of "413bbb", where each "b" represents a blank character.

If no file processing is necessary, that is, no STRATA or COLLAPSE parameters are included, the output data file will not be created. In this case, the report will be generated directly from the input data file, which may or may not have been sorted first.

4.4 Output Parameter File

Selected parameter information is written to the output parameter file, named in the OUTPARAMETERS record, for use in possible subsequent runs of EVOLVE on the same data set. The information contained in this file includes:

1. Number of ranges defined for each of the stratifying variables.
2. Total number of collapses.
3. Number of runs that have had collapsing on the same data set.
4. Highest stratifying variable number referenced in any of the runs.
5. Character strings consisting of the ranges defined for the stratifying variables.
6. Character strings consisting of the names assigned to the stratifying variables.
7. Character string consisting of the name of the cluster variable.
8. Column range of the cluster variable.
9. Sequence order of the stratifying variables.

10. Collapsing formulas.
11. Arrays containing the beginning and ending indices of the sets of collapses in the collapsing table.
12. Collapsing table, if any.

4.5 Past Parameter File

As noted in the Background and diagrammed in the System Flow sections of this report, the user may accomplish the desired stratification of a set of data in a single execution of EVOLVE or as an iterative process of successive executions of EVOLVE on the original data set. After the first run of EVOLVE, each successive run on the original data set, which may modify previous stratification schemes or collapse together previously defined strata, requires the input of past parameter information contained in the output parameter file of the last previous execution of EVOLVE. This past parameter file is named in the PASTPARAMETERS record. In section 10.0, the past parameter file of example 3 is the output parameter file of example 2.

4.6 Nodepoint File

The nodepoint file, named in the NODEFILE parameter record, specifies up to 12 vertices, or nodepoints, of a set of up to 9 non-intersecting polygons. The nodepoints of each polygon are listed as a set of contiguous records, followed by a record containing the termination characters "999/", indicating that all nodepoints for the polygon have been specified. Each record of this file, then, contains either the coordinates of a polygon nodepoint or the termination characters. Coordinates are specified in FORTRAN list-directed format strings as degrees and minutes of latitude, hemisphere, degrees and minutes of longitude, hemisphere. For example, the record "33,15,'N',117,25,'W'" defines a coordinate at 33 degrees and 15 minutes north latitude and 117 degrees and 25 minutes west longitude. It should be noted as an example that the same four points which define a four-sided polygon also define two triangles with a common vertex, depending on which pairs of points are connected with straight line segments. For each polygon specified in this file, EVOLVE is programmed to assume that the sides of the polygon desired are those generated by connecting with straight line segments its first and last nodepoints and each two consecutive nodepoints. The user must be aware that the order of listing of the nodepoints determines the perimeter of the polygon according to the assumption above. Example 1 of section 10.0 contains the listing of the records of a nodepoint file which defines two polygons with 10 and 12 vertices, respectively.

5.0 PARAMETER RECORDS DESCRIPTIONS

As noted in section 4.1, the 15 parameter records described in detail in this section, control program execution. Each record, or card image, is a list of fields and field separators for a total length of up to 80 characters. The first field of the record is the required parameter record name field. Other fields which may follow are file name, variable name, polygon label, collapsing formula, stratifying variable number, column range, variable value range, type and kind of statistic, and FORTRAN data format specification. Valid field separators are one or more blanks or commas. Individual strata numbers within a collapsing formula field are separated by blanks, the equal (=) or plus (+) signs, as appropriate, and low and high values in the column range or in the variable value range fields are separated by a dash (-).

General rules governing parameter records and their fields are summarized below:

1. The INDATA, OUTDATA and OUTPARAMETERS parameter records must be included in every run of EVOLVE.
2. Parameters may be entered in any order except the PASTPARAMETERS record, which must always be the first parameter when it is used.
3. Each STRATA parameter must be accompanied by either an associated RANGE or NODEFILE parameter, but not both, unless the intention is to delete the stratifying variable, in which case the STRATA record is accompanied by neither a RANGE nor a NODEFILE parameter.
4. At least one STRATA parameter must be included in the initial run of EVOLVE on any data file.
5. Each RANGE and NODEFILE parameter must have one associated STRATA parameter.
6. Variable names and polygon labels are limited to a maximum length of 8 characters, containing no embedded blanks or commas.
7. File names used must conform to file naming conventions of the VAX computer system.
8. Column range is a field on a parameter record containing the beginning and ending column, separated by a dash, of a field on a data record which contains the value for a cluster, stratifying or statistics variable. Such fields defined on data records are limited to a maximum of 11 characters in width; the beginning column number must not exceed the ending column number, and both the beginning and ending column numbers must be positive integers less than 395.

Notation conventions used in the following format sections are:

<u>Convention</u>	<u>Example</u>	<u>Significance</u>
Uppercase letters	NOGO	Indicates the parameter record name field.
Lowercase letters	column range	Indicates a user-supplied field.
Underscoring	<u>OUTDATA</u>	Indicates a required field; the absence of underscoring indicates an optional field.
Ellipsis	. . .	Indicates a portion of a field or an entire field may be repeated.

5.1 CLUSTER

5.1.1 Description

This parameter is used to define a cluster variable. The file will be sorted by this field within stratum, and statistics will be computed by this variable. For instance, if the cluster variable were household and each record contained data for an adult of the household, then N would be the number of different households that occurred in that stratum and M (mean) would be the average number of adults (or records) per household. Any cluster statistics requested for other variables would be calculated on the variables summed over households.

5.1.2 Format

CLUSTER cluster variable name column range

5.1.3 Example

CLUSTER CRUISES 115-118

5.1.4 Usage Note

1. At most one CLUSTER parameter record is allowed per run.
2. See item 8 in section 5.0 for column range restrictions.
3. Refer to examples 1 and 4 of section 10.0 for sample runs with a cluster variable.

5.2 COLLAPSE

5.2.1 Description

This parameter record is used to enter collapsing formulas. These formulas enable the user to lump strata together when some strata or cells are found to have insufficient data. Cell numbers of data records belonging to

strata which are combined are physically changed to the new stratum numbers. The collapsed-into stratum may in turn be collapsed into another stratum in a subsequent run. A collapsed-into stratum number should be followed by a "C" to make the formulas clearer.

5.2.2 Format

COLLAPSE collapsing formula

where the collapsing formula is of the form below.

$$\begin{array}{ccccccc} \text{into-stratum} & = & \text{from-stratum} & + & \text{from-stratum} & + & \dots \\ \text{number} & & \text{number} & & \text{number} & & \end{array}$$

5.2.3 Example

COLLAPSE 112C = 112 + 113 + 114C

5.2.4 Usage Notes

1. A maximum of 25 COLLAPSE parameter records are allowed in all runs on the same data set.
2. A maximum of 50 from-strata are allowed per run.
3. A maximum of 5 separate runs of EVOLVE are allowed which perform collapsing on the same data file.
4. To collapse more strata into one stratum than will fit on one parameter record, repeat the record with the same into-stratum and the additional from-strata as follows.

COLLAPSE 11C = 11 + 12 + 13 + 14 + 15

COLLAPSE 11C = 16 + 17 + 18 + 19 + 20

5. Refer to example 3 of section 10.0 for an illustration of the use of this parameter record.

5.3 INDATA

5.3.1 Description

This parameter record is used to provide the name of the input data file, which may be either raw data or a file output by a previous run of EVOLVE.

5.3.2 Format

INDATA input data file name

5.3.3 Examples

INDATA MX76.DAT

INDATA MX76

5.3.4 Usage Note

1. This parameter record must be present in every run. Refer to any of the examples in section 10.0.
2. The input data file name type specification (.DAT) may be included or omitted.

5.4 NODEFILE

5.4.1 Description

This parameter record names a nodepoint file associated with a stratifying variable and names the geographic regions defined by the nodepoints. The geographic position on each input data record is examined to determine in which polygon it belongs. The geographic position on the input data record must be of the form degrees and minutes of latitude, "N" or "S" or "1" or "2", degrees and minutes of longitude, "E" or "W" or "1" or "2" (example: 5015N11530W). See section 4.6 for a description of the nodepoint file.

5.4.2 Format

	stratifying	nodepoint	polygon	polygon	
<u>NODEFILE</u>	<u>variable number</u>	<u>file name</u>	<u>label 1</u>	<u>label 2</u>	...

where stratifying variable number (see section 5.14) is the number of the stratifying variable associated with the NODEFILE parameter, and polygon label 1, polygon label 2, and so on, are names identifying in order each of the polygonal regions defined in the nodepoint file.

5.4.3 Example

NODEFILE 2 CYRA77.DAT INSIDE OUTSIDE

5.4.4 Usage Notes

1. Only one NODEFILE parameter may be included per run.
2. A maximum of 9 polygons may be defined in the nodepoint file.
3. Each polygon defined may contain at most 12 vertices or nodepoints.
4. The number of polygon labels must equal the number of polygons defined in the nodepoint file.

5. This parameter must be accompanied by a STRATA parameter with the same stratifying variable number.
6. The length of the column range of the stratifying variable associated with any NODEFILE parameter must be exactly 11 columns to accommodate the geographic position format outlined in the above description.
7. Refer to example 1 of section 10.0 for an example of the use of this parameter.

5.5 NOGO

5.5.1 Description

This parameter record halts program execution after all parameter records have been read and errors printed, and is thus useful as a debugging tool. The user may include this parameter on a high priority run to check for errors, and later remove the parameter on a low priority run after all errors have been corrected.

5.5.2 Format

NOGO

5.5.3 Example

NOGO

5.6 NOLIMIT

5.6.1 Description

This parameter record allows the user to override the default limit of 100 strata. The total number of strata needed is computed by multiplying together the number of ranges which are defined for each stratifying variable. The ranges and stratifying variables used are all the ones defined in the current as well as the preceding runs of EVOLVE. Since at most 5 stratifying variables may be defined, each with 9 ranges, the largest possible number of strata is 9^5 . A limit of 100 was chosen as a reasonable number of strata which could be carefully analyzed. When using the NOLIMIT parameter, beware of the possibility of creating a lot of output. If the main objective is stratification, and there is no need to analyze the data by cell, then the NOLIMIT parameter could be used in conjunction with the NOPRINT parameter record.

5.6.2 Format

NOLIMIT

5.6.3 Example

NOLIMIT

5.7 NOPRINT

5.7.1 Description

This parameter record prevents the printing of record counts and statistics after file processing and sorting are completed.

5.7.2 Format

NOPRINT

5.7.3 Example

NOPRINT

5.8 OUTDATA

5.8.1 Description

This parameter record assigns a name to the output data file.

5.8.2 Format

OUTDATA Output data file name

5.8.3 Example

OUTDATA MX7601.DAT

5.8.4 Usage Notes

1. This parameter must be present in each run. Refer to any of the examples in section 10.0.
2. If no file processing is necessary, that is, if no STRATA or COLLAPSE parameter records are entered, this file is not created.
3. Use of the file name type specification (.DAT) is recommended with the output data file name.

5.9 OUTPARAMETERS

5.9.1 Description

This parameter assigns a name to the output parameter file, which contains the collapsing arrays, if any, the stratifying variable names and ranges and other information needed by any subsequent runs of EVOLVE on the

same set of data.

5.9.2 Format

OUTPARAMETERS output parameter file name

5.9.3 Example

OUTPARAMETERS PARMXI.DAT

5.9.4 Usage Note

1. This parameter record must be present in each run of EVOLVE. Refer to any of the examples of section 10.0.
2. Use of the file name type specification (.DAT) is recommended with the output parameter file name.

5.10 PASTPARAMETERS

5.10.1 Description

This record supplies the name of the past parameters file. The past parameters file must have been created as the output parameter file by a previous run of EVOLVE.

5.10.2 Format

PASTPARAMETERS past parameter file name

5.10.3 Examples

PASTPARAMETERS PARCSP02

PASTPARAMETERS PARCSP02.DAT

5.10.4 Usage Notes

1. This record is required on all runs of EVOLVE except the first on a raw input data file.
2. When included, this record must be the first parameter entered, as demonstrated in examples 3 and 4 of section 10.0.
3. Although the past parameters file contains information generated by previous runs of EVOLVE, in each run of EVOLVE the user must supply any new stratifying and clustering information, collapsing formulas, input and output file names, variable names and statistics desired.
4. The type specification (.DAT) of the past parameter file name may be included or omitted.

5.11 RANGE

5.11.1 Description

This parameter record defines the range limits of the stratifying variables. If the second stratifying variable is to be vessel size as in the first example below, range 1 could be 0 to 10 tons, range 2 could be 11 to 99 tons and range 3 could be 100 to 1000 tons. When the value of the stratifying variable of a record is not contained within any of the defined ranges, the record will not be output to the output data file. Range values must be non-negative integers or decimal fractions. If a NODEFILE record is paired with a stratifying variable, it replaces the RANGE record.

5.11.2 Format

	stratifying	stratifying variable	
<u>RANGE</u>	<u>variable number</u>	<u>value range 1</u>	...

5.11.3 Examples

RANGE 2 0-10 11-99 100-1000

RANGE 3 .1-.1 .2-.2 .3-.3

5.11.4 Usage Notes

1. A maximum of 9 value ranges may be defined for any stratifying variable.
2. This parameter should only be used when a STRATA parameter with the same stratifying variable number is used.
3. In every variable value range, the upper limit must be greater than or equal to the lower limit of the same range and less than the lower limit of the succeeding range.
4. See examples 2 and 4 of section 10.0 for sample runs containing the range parameter.

5.12 REORDER

5.12.1 Description

This parameter record controls the way the output data file is sorted and the strata statistics arrays are printed. The default order is 1 to 5, low to high. Stratifying variable 1 will appear as the columns of the array, and stratifying variable 2 will be the rows. Stratifying variables 3, 4 and 5 will appear as array labels at the top of the page. To get the 3rd and 4th stratifying variables to be the columns and rows of the array, respectively, use a REORDER parameter with the numbers 3 4 1 2.

5.12.2 Format

REORDER stratifying variable number ...

where stratifying variable numbers are in user desired order, low to high.

5.12.3 Examples

REORDER 2 1

REORDER 5 4 1 2 3

5.12.4 Usage Notes

1. In the list of stratifying variable numbers of the REORDER parameter, all the numbers up to the maximum must be present. That is, if the user wishes for variables 4 and 5 to appear as the columns and rows of the arrays, rather than in the default position as labels at the top of the page, all 5 stratifying variable numbers must appear on the REORDER parameter. If stratifying variable numbers 1 and 2 are to be reversed, then variable numbers greater than 2 need not be included.
2. At most one REORDER parameter is allowed per run.
3. Refer to example 3 of section 10.0 for an example of the use of this parameter.

5.13 STATISTICS BY

5.13.1 Description

This parameter record determines which statistics are to be computed. If no statistics parameter record is entered, record counts will be printed. Statistics can be requested by RECORD, by CLUSTER, or both. The statistics that can be selected are MEAN and STANDARD DEVIATION and will be computed for the variables defined in the VARIABLE parameter record(s).

5.13.2 Format

STATISTICS BY type kind

where type is either RECORD or CLUSTER and kind is either MEAN or STANDARD DEVIATION, or both.

5.13.3 Examples

STATISTICS BY RECORD MEAN

STATISTICS BY CLUSTER MEAN STANDARD DEVIATION

5.13.4 Usage Notes

1. Statistics may be requested by record and by cluster in the same run by entering two STATISTICS BY card images, one with type RECORD and another with type CLUSTER.
2. If statistics over records are requested, then at least one VARIABLE record must be included.
3. If statistics over cluster are requested, then no VARIABLE records are required, but a CLUSTER parameter record must be included.
4. In section 10, examples 1 and 4 show sample runs which include this parameter, and examples 2 and 3 show sample runs which omit this parameter.

5.14 STRATA

5.14.1 Description

This parameter record defines the names of the stratifying variables and their positions on the data record as in the first and third examples below. It can also be used, as in the second example below, to delete a stratifying variable by entering only the stratifying variable number and leaving the name, range and format blank. A stratifying variable can be changed by entering a new STRATA parameter record with the same stratifying variable number, and a new stratifying variable can be added to a previously stratified file. It is preferable to number stratifying variables consecutively beginning with one. If a stratifying variable number is deleted or skipped, the strata numbers on the records will have a zero in that position.

5.14.2 Format

	stratifying	stratifying	column
<u>STRATA</u>	<u>variable number</u>	variable name	range format

where the optional format field is a valid FORTRAN data format specification enclosed in parentheses.

5.14.3 Examples

STRATA 1 CAPACITY 110-115 (F6.1)

STRATA 2

STRATA 3 SIZE 19-23

5.14.4 Usage Notes

1. The stratifying variable number must be an integer from 1 through 5.

2. Records out of range in one run are not included in the output data file and thus cannot be recovered in a subsequent run on this output data file by merely redefining the stratifying variable. Instead, the user must input the original raw data file.
3. If the intention is to define a new stratifying variable (example 1 of section 10.0) or to change an existing one (capacity in example 4 of section 10.0), this record must be paired with either a RANGE or NODEFILE record, but not both, with the same stratifying variable number.
4. If the intention is to delete a stratifying variable (class in example 4 of section 10.0), no accompanying RANGE or NODEFILE record should be present.
5. At least one STRATA parameter must be included in any run of EVOLVE, either as an explicit record in the parameter records file or implicitly referred to in the PASTPARAMETERS record.
6. Input records whose stratifying variable value is blank or contains non-numeric characters other than a decimal point are considered to belong to none of the defined ranges and are not output to the output data file. Acceptable characters are "0", "1", ..., "9" and ".".
7. See item 8 of section 5.0 for column range restrictions.
8. The format field should be omitted when the stratifying variable values have no implied decimal point, that is, when they are integers as in examples 1, 2 and 4 of section 10.0.

5.15 VARIABLE

5.15.1 Description

This parameter record defines the variables for which statistics are to be computed.

5.15.2 Format

VARIABLE variable name column range format

where the optional format field is a valid FORTRAN data format specification enclosed in parentheses.

5.15.3 Examples

VARIABLE KILL 57-63

VARIABLE LENGTH 92-99 (F8.2)

5.15.4 Usage Notes

1. The format field should be omitted when variable values have no implied decimal point, that is, when they are integers.
2. No more than 3 VARIABLE parameters may be included in any execution of EVOLVE.
3. Should any variable field for any record be blank or contain any non-numeric characters other than a decimal point, the entire record is considered to be missing.
4. See item 8 of section 5.0 for column range restrictions.
5. Whenever a VARIABLE parameter is included, a STATISTICS BY parameter must also be included.
6. Examples 1 and 4 demonstrate the use of this parameter.

6.0 PROGRAM ASSUMPTIONS AND LIMITS

6.1 Assumptions

1. See section 5.0 for general rules regarding parameter records usage.
2. Records whose stratifying variables are blank or contain non-numeric characters other than a decimal point (e.g., negative numbers) cannot be assigned to any stratum and therefore are considered outside the range and not output to the output data file.
3. If either or both of the hemisphere indicators of a geographic position stratifying variable (see section 5.4.1) of an input record are integers other than "1" or "2", then the record cannot be assigned to any polygon and is therefore considered outside the geographic range and not output to the output data file.
4. Records whose statistics variables are blank or contain non-numeric characters other than a decimal point (e.g., negative numbers) are considered as missing data.
5. All input variable values (CLUSTER, STRATA, VARIABLE) must be right-justified within their column ranges.

6.2 Limits

<u>TYPE</u>	<u>LIMIT</u>
1. Per run of EVOLVE	
a) number of cluster variables	1
b) number of stratifying variables	5
c) number of variables defined for statistics computations	3
d) number of ranges per stratifying variable	9
e) number of strata defined	100 (NOLIMIT parameter omitted)
	9 ⁵ (NOLIMIT parameter included)
f) number of times same column range may be used by CLUSTER, STRATA or VARIABLE parameters	1
g) number of from-strata in all COLLAPSE records	50

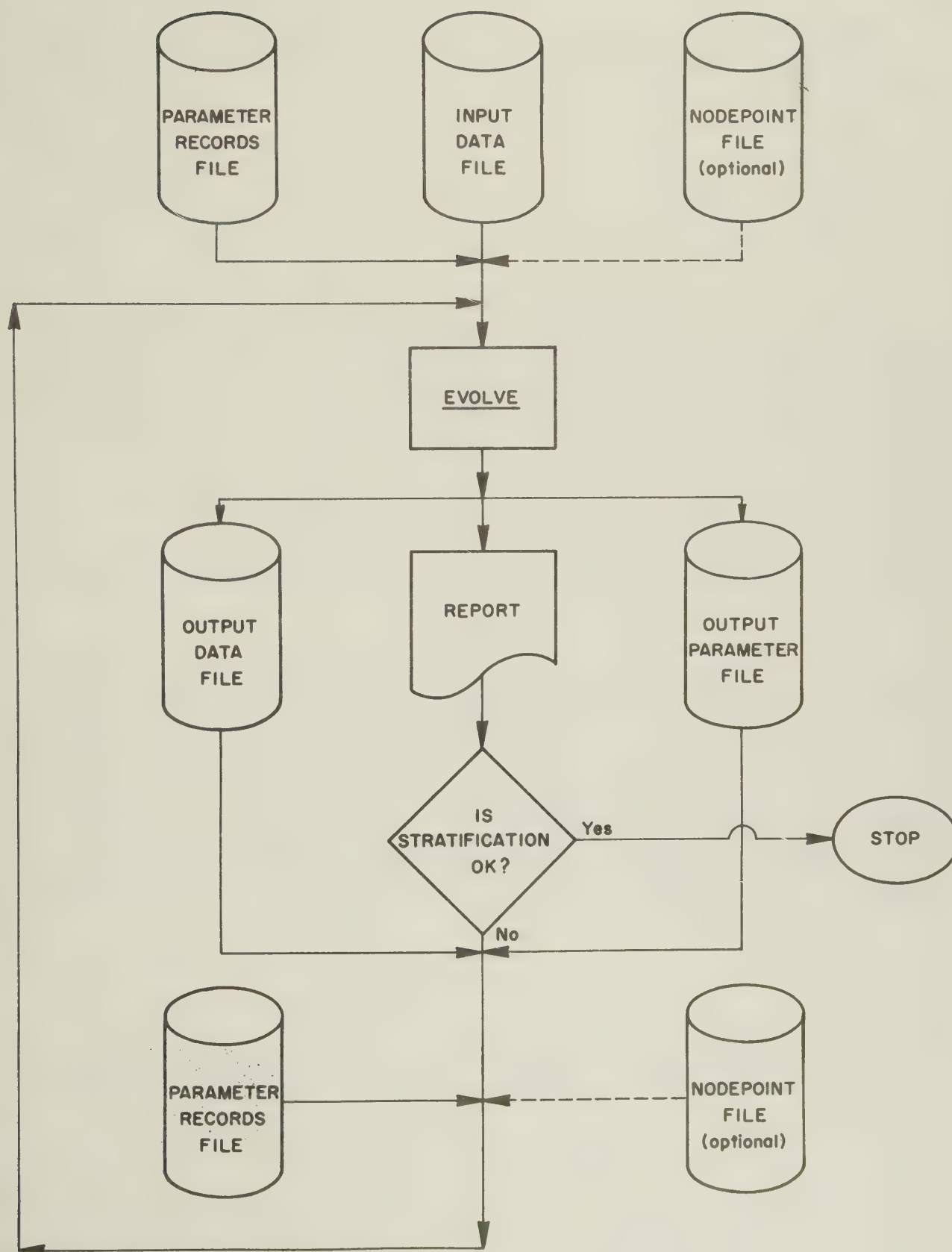
h) number of nodepoint files	1
i) number of REORDER parameter records	1
2. Variable name or polygon label	8 characters containing no embedded blanks or commas
3. File	
a) file names	Refer to VAX file naming conventions
b) nodepoint file	
i) number of polygons	9
ii) number of vertices per polygon	12
4. Per record	
a) number of characters per input record	394
b) number of characters per parameter record	80
5. Number of characters of input data record spanned by column range on CLUSTER, STRATA, or VARIABLE parameter	11
6. Number of COLLAPSE parameter records in all runs on the same data set	25
7. Number of separate runs of EVOLVE which perform collapsing on the same data file	5

7.0 SYSTEM FLOW

Obtaining the desired stratification of a data set can be a recursive process, as diagrammed on the next page and illustrated by examples 2, 3 and 4 of section 10.0. Input to the first run of EVOLVE on a data set, as described in the upper third of the diagram, is unique, consisting of a parameter records file, a raw input data file, and an optional nodepoint file. For subsequent runs on the same data, as described in the lower third of the diagram, the input consists of a new parameter records file, an optional nodepoint file, and the output data and output parameters files created by the previous run. In all cases the program output consists of an output data file, a printed report and an output parameter file as shown in the middle third of the diagram.

Each time the program is run, the user examines the output report to determine if the stratification is satisfactory. If it is, processing is complete. If it is not, the output data file and output parameter file are input to EVOLVE along with a new parameter records file and an optional nodepoint file.

SYSTEM FLOW DIAGRAM



8.0 EXECUTION INSTRUCTIONS

The program may be executed interactively or as a batch job. A sample set of commands might look like:

```
RUN EVOLVE  
  
INDATA CRSP76.DAT  
  
OUTDATA CRSP01.DAT  
  
OUTPARAMETERS PARMX1.DAT  
  
STRATA 3 CLASS 15-15  
  
RANGE 3 1-1 2-2 3-3
```

The above commands may be inserted into a command file, which may then be executed either as a batch job or interactively. As an alternate mode of interactive execution, the user may enter "RUN EVOLVE", then type the desired parameter records one at a time terminated by the "CONTROL Z" character which signifies the end of a set of parameter records. Use of a command file is the generally preferred mode of execution because if an error is discovered in the parameters, individual records in the file may be corrected rather than reentering the entire set of parameter records. If the user wishes to suppress VAX system page headings from the output, then the output should be directed to a user named print file. This can be done by inserting "\$ASSIGN Filename FORØØ6" before "RUN EVOLVE" and "\$PRINT Filename" following the last parameter record, where "Filename" is a user chosen name for the print file.

When a cluster variable is defined within a run of EVOLVE, the output data file is sorted after its initial creation. Since the VAX system does not write over an existing file, two potentially large output data files, one unsorted and one sorted, are created with the same name and type but with successive version numbers. In example 1 of section 10.0, the unsorted output data file created was MX7601.DAT;1 and the sorted version was MX7601.DAT;2. After creation of the sorted version of the output data file, the unsorted version is of no further use. Therefore, the user is advised to include in the command stream, after the execution of EVOLVE, a command to delete all versions of the output data file except the latest ("PURGE MX7601.DAT" in example 1 of section 10.0) so that only the sorted version, with the largest version number, is saved.

9.0 ERROR MESSAGE EXPLANATIONS

EV001 - INVALID PARAMETER NAME

The parameter name was probably misspelled. It must be one of the following: STRATA, RANGE, COLLAPSE, VARIABLE, STATISTICS BY, NODEFILE, REORDER, CLUSTER, NOGO, NOPRINT, NOLIMIT, INDATA, OUTDATA, OUTPARAMETERS, PASTPARAMETERS.

EV002 - STRATA NUMBER GREATER THAN 5

This error occurs when any parameter which requires a stratifying variable number has a number greater than 5 (i.e., the STRATA, RANGE and NODEFILE parameters). Check that the record has the correct format.

EV003 - THIS STRATIFYING VARIABLE HAS A NODEFILE

This error will occur when the stratifying variable number on the RANGE parameter record has already been used by a NODEFILE parameter record. When the intention is to define a new stratifying variable or to change an existing one, the stratifying variable must have either a RANGE or a NODEFILE associated with it but not both. Either eliminate the RANGE or NODEFILE cards or change the strata number on one of them.

EV004 - INVALID NUMERIC FIELD

This error occurs when the high or low range limits on the RANGE parameter record contain one or more characters which are not numbers or a decimal point. Check for typing errors or an incorrect record format.

EV005 - END RANGE LESS THAN BEGIN

The high range limit must be greater than or equal to the low range limit on the RANGE parameter record. Check for typing errors or an incorrect record format.

EV006 - RANGES OVERLAP

The high range limit of one range must be less than the low range limit of the following range. For instance,

RANGE 1 1-100, 101-200 is correct, but

RANGE 1 1-100, 100-200 is incorrect.

EV007 - MORE THAN 9 RANGES

On a RANGE parameter record the limit on sets of ranges is nine. This number must be reduced to 9 or less for the program to run.

EV008 - MORE THAN 25 COLLAPSES

This error occurs when more than 25 COLLAPSE parameter cards are entered in all runs on the same data set. The number must be reduced to 25 or less for the program to run.

EV009 - CELL NUMBER HAS WRONG NUMBER OF CHARACTERS

This error occurs when the number of characters in the strata numbers of the COLLAPSE parameter records are inconsistent. All strata numbers must have the same number of numeric characters. For example,

COLLAPSE 111C = 111 + 112 + 113C is correct, but

COLLAPSE 111C = 11 + 12 + 1131 is incorrect.

EV010 - MORE THAN 50 STRATA BEING COLLAPSED

This error occurs when the total number of strata being collapsed into other strata in one run is more than 50. This number will have to be reduced to 50 or less for the program to run.

EV011 - MORE THAN 3 VARIABLES

This error occurs when more than 3 VARIABLE parameter records have been entered in one run. To get statistics on more than 3 variables, they will have to be broken up into additional runs.

EV012 - MISSING BY RECORD OR CLUSTER

This error occurs when a STATISTICS BY parameter record has been entered but fails to specify RECORD or CLUSTER. Check for misspelling or an invalid record format.

EV013 - MORE THAN ONE NODEFILE DEFINED

This error occurs when more than one NODEFILE parameter record has been entered. Only one NODEFILE is allowed per run.

EV014 - THIS STRATIFYING VAR HAS RANGE VALUES ASSIGNED

This error occurs when the stratifying variable number on the NODEFILE parameter record was the same stratifying variable number used on a RANGE parameter card. Each STRATA parameter must have a RANGE or NODEFILE parameter record associated with it, but not both.

EV015 - ILLEGAL FILENAME OR MISSING FILE

This error occurs when the filename on the PASTPARAMETERS, INDATA or NODEFILE parameter record is incorrect. Make sure the name is that of an existing file.

EVØ16 - MORE THAN 9 POLYGON LABELS

This error occurs when the NODEFILE parameter record has more than 9 polygon labels. This number must be reduced to 9 or less for the program to run.

EVØ17 - MORE THAN 1 REORDER RECORD

This error occurs when more than one REORDER parameter record has been entered in the same run. To correct this error, leave in the REORDER which is desired and remove the others.

EVØ18 - DUPLICATE OR MISSING STRATIFYING VARIABLES

This error occurs when a REORDER parameter record has been entered with incorrect stratifying variable numbers. If 4 strata numbers are entered, they must be the numbers 1 through 4 in any order. In this case,

REORDER 4 2 1 3 is correct, but

REORDER 3 1 is incorrect.

EVØ19 - MORE THAN ONE CLUSTER DEFINED

This error occurs when more than one CLUSTER parameter record has been entered. To cluster on more than one variable, additional runs will have to be made.

EVØ2Ø - INVALID FILENAME

This error occurs when the filename on the OUTDATA or OUTPARAMETERS parameter record is invalid. Check the name for too many or invalid characters.

EVØ21 - PASTPARAMETERS RECORDS MUST BE FIRST PARAMETER

This error occurs when the PASTPARAMETERS record has been included in the parameter records file but not as the first record. Move this record to the first position for the program to run.

EVØ22 - ENDING COLUMN LESS THAN BEGIN

This error occurs when the column range on a VARIABLE, STRATA or CLUSTER parameter record is invalid. Check the record for typing errors and an incorrect record format.

EVØ23 - COLUMN RANGE GREATER THAN 11

This error occurs when the column range on a VARIABLE, STRATA or CLUSTER parameter record is greater than 11. Eleven columns is the greatest field width allowed.

EVØ24 - ENDING COLUMN GREATER THAN 394

This error occurs when the ending column number on a VARIABLE, STRATA or CLUSTER parameter record is greater than 394. The maximum allowable input record length is 394 characters. Therefore, the column range should not exceed 394.

EVØ25 - OVERLAP WITH PREVIOUS COLUMN RANGE

This error occurs when the columns defined in a STRATA, VARIABLE or NODEFILE parameter record were defined in a previous parameter record. Columns in the data record can only be used once in one run.

EVØ26 - RANGE DEFINED WITHOUT A STRATA

This error occurs when a RANGE parameter record has been entered, but there was no STRATA parameter record with the same stratifying variable number. For every RANGE parameter record there must be one STRATA parameter record.

EVØ27 - NODEFILE DEFINED WITHOUT A STRATA

This error occurs when a NODEFILE parameter record has been entered, but there was no STRATA parameter record with the same stratifying variable number. Make sure that the stratifying variable number on the NODEFILE parameter record is correct, and/or enter a STRATA parameter record for the NODEFILE.

EVØ28 - STRATA DEFINED WITHOUT A RANGE OR A NODEFILE

This error occurs when a STRATA parameter record has been entered, but there was no RANGE or NODEFILE record with the same stratifying variable number. Only when a stratifying variable is being deleted is it allowed not to be paired with a RANGE or NODEFILE parameter. In this case, the stratifying variable name, column range and format should be blank.

EVØ29 - INDATA PARAMETER RECORD MISSING

This message appears when the INDATA parameter record is missing or the filename on the record was blank. Correct the record or add one.

EVØ3Ø - OUTDATA PARAMETER RECORD MISSING

This message appears when the OUTDATA record is missing or the filename on the record was blank. Correct the record or add one.

EVØ31 - OUTPARAMETERS RECORD MISSING

This message occurs when the OUTPARAMETERS record is missing or the filename on the record was blank. Correct the record or add one.

EV032 - CLUSTER STATS REQUESTED BUT NO CLUSTER DEFINED

This error occurs when the parameter records include a STATISTICS BY CLUSTER record, but no CLUSTER parameter record. To correct this error, remove the STATISTICS BY CLUSTER record or add a CLUSTER parameter record.

EV033 - RECORD STATS BUT NO VARIABLES REQUESTED

This error occurs when the parameter records include a STATISTICS BY RECORD parameter, but no VARIABLE parameter record. To correct this error, remove the STATISTICS BY RECORD parameter or add up to three VARIABLE parameter records.

EV034 - VARIABLES DEFINED BUT NO STATISTICS REQUESTED

This error occurs when one or more VARIABLE parameter records have been entered, but no STATISTICS BY parameter record was entered. Variables are only used for printing statistics. To correct the error, either request statistics or remove the VARIABLE parameter records.

EV035 - TOTAL NUMBER OF CELLS GREATER THAN 100

The error occurs when the number of cells needed (calculated by multiplying together the number of ranges within each stratifying variable) exceeds 100 and the NOLIMIT parameter was not included. This error can be eliminated by either reducing the number of stratifying variables or the number of ranges defined or by inserting the NOLIMIT parameter. The user should beware of the possibility of printing more pages and more arrays than can be carefully analyzed.

EV036 - NO STRATA DEFINED

This error occurs when no STRATA parameter records have been entered in this or any preceding runs or else all stratifying variables were deleted. At least one stratifying variable must be defined for the program to run.

EV037 - STRATA COLUMN RANGE MUST BE 11 FOR NODEFILE

This message occurs when a nodefile is defined without a corresponding STRATA parameter record or when there is a STRATA parameter record but the column range is not exactly 11 characters long. Eleven character positions are required to contain the geographic position in longitude and latitude. See section 5.4.1 for a description of the format required for geographic position.

EV038 - NUMBER OF POLYGONS AND POLYGON NAMES DIFFER

This error may appear when a nodepoint file is used. When the polygons defined in the nodepoint file are validated, they are counted. This number must match the number of polygon names entered on the NODEFILE parameter record. To correct the error, either change the NODEFILE parameter record or the nodepoint file.

EVØ39 - ATTEMPTING TO COLLAPSE SAME DATA 6 TIMES

A series of collapses can be done on the same data in successive runs. The upper limit to the number of times this can be done is 5. If more collapsing is required, it will be necessary to go back to a previous step and include more collapsing in one run.

EVØ42 - INVALID STATISTIC REQUESTED

This error occurs when the kind field on the STATISTICS BY parameter record is something other than MEAN or STANDARD DEVIATION. Check for any typing errors and for an invalid record format.

EVØ43 - COLLAPSING CELL # HAS WRONG NUMBER OF CHARACTERS

This error occurs when collapsing is being done and the strata number is not the size of the record key. The length of the key is the number of the highest stratifying variable referenced. If stratifying variables 1 and 3 have range values and strata 2 was deleted, the record key is 3 positions.

LNØØ1 - MISSING FIELD

This error occurs when a parameter record is being decoded and a field is expected but not found. Check the format requirements for the record in question.

LNØØ2 - INVALID FIELD SEPARATOR

This error occurs when a parameter record is being decoded and a field separator like a "=" or "-" is missing. Check the format requirements for the record in question.

LNØØ3 - INVALID NUMERIC FIELD

This error occurs when a parameter record is being decoded and non-numeric characters were found in a field which should be numeric, such as column number. Check the format requirements for the record in question.

10.0 EXAMPLES

Jobstream outputs, input and output data files for four examples are included in this section as an aid to understanding how to use EVOLVE. In order to reduce the number of pages in this section, data file listings which originally spanned more than one computer page were spliced together to fit on a single page. The first page of each example jobstream output contains an EVOLVE-generated listing of the parameter records exactly as they were input. Refer to section 8.0 for instructions to make an interactive or batch run of EVOLVE using these parameters.

Example 1 demonstrates the use of a cluster variable, a nodepoint file used together with a stratifying variable, and the output of statistics. Example 2 includes no cluster variable definition, three stratifying variables and no request for calculation of statistics. Example 3 collapses together some of the strata defined by example 2 and demonstrates the use of the REORDER parameter. Example 4 deletes a stratifying variable and changes the definition of the other stratifying variables defined in example 2. Examples 3 and 4 do not include listings of their input data file since in both examples the input data file is the output data file of example 2, which is listed along with example 2 jobstream output.

Example 1. Jobstream Output.

AT 25-MAR-81 09:27:49 PAGE 1

OUTPUT FROM EVOLVE.FOR;1 (SUBROUTINE PLANIT.FOR;1)

*****ERROR MESSAGES*****

*****PARAMETER RECORDS*****

CLUSTER CRUISNUM 1-3

INDATA NX76.DAT

OUTDATA NX7601.DAT

OUTPARAMETERS PARMX1.DAT

STRATA 1 LOCATION 10-20

NODEFILE 1 CYRA77.DAT IS-CYRA OS-CYRA

VARIABLE CYRA 25-25

STATISTICS BY RECORD MEAN STANDARD DEVIATION

STATISTICS BY CLUSTER MEAN STANDARD DEVIATION

Example 1. Jobstream Output (continued).

AT 25-MAR-81 09:28:26 PAGE 2

OUTPUT FROM EVOLVE.FOR;1 (SUBROUTINE PLANIT.FOR;1)

NODEFILE EDIT (SUBROUTINE POLYED.01)

POLYGON NODE POINT DATA FROM CYRA77.DAT FILE.

NODE POINT DATA FROM FILE - 2 POLYGONS.

POLYGON NO. 1 - 10 POINTS.

40.	0.	N	125.	0.	W
40.	0.	N	40.	0.	W
30.	0.	S	40.	0.	W
30.	0.	S	90.	0.	W
3.	0.	S	90.	0.	W
3.	0.	S	95.	0.	W
5.	0.	N	95.	0.	W
5.	0.	N	115.	0.	W
20.	0.	N	115.	0.	W
20.	0.	N	125.	0.	W
999.0000					

POLYGON NO. 2 - 12 POINTS.

40.	0.	N	125.	0.	W
40.	0.	N	180.	0.	W
40.	0.	S	180.	0.	W
40.	0.	S	40.	0.	W
30.	0.	S	40.	0.	W
30.	0.	S	90.	0.	W
3.	0.	S	90.	0.	W
3.	0.	S	95.	0.	W
5.	0.	N	95.	0.	W
5.	0.	N	115.	0.	W
20.	0.	N	115.	0.	W
20.	0.	N	125.	0.	W
999.0000					

Example 1. Jobstream Output (continued).

OUTPUT FROM EVOLVE.01

AT 25-MAR-81 09:29:03 PAGE 3

READY TO DO IT

RECORDS READ = 129 RECORDS OUTPUT = 128

1 RECORDS FELL OUTSIDE STRATA 1(LOCATION) RANGES

READY TO SORT IT

STRATIFYING VARIABLE: LOCATION 1 2
RANGE: IS-CYRA OS-CYRA

READY TO VIEWIT

OUTPUT FROM EVOLVE.01 (SUBROUTINE VIEWIT.01)

STATISTICS BY RECORD
FOR THE FOLLOWING ARRAY,
CELL NUMBER = A WHERE A = LOCATION

```

* LOCATION
* IS-CYRA * OS-CYRA *
*****
*CELL#1 *CELL#2 *
RECORDS = * 77 * 51 *
N= * 77 * 51 *
CYRA M= * 1.0000* 2.0000*
SD= * 0.0000* 0.0000*
*****

```

OUTPUT FROM EVOLVE.01 (SUBROUTINE VIEWIT.01)

AT 25-MAR-81 09:30:10 PAGE 5

STATISTICS BY CLUSTER(CRUISNUM)
FOR THE FOLLOWING ARRAY,

CELL NUMBER = A WHERE A = LOCATION

```

* LOCATION
* IS-CYRA * OS-CYRA *
*****
*CELL#1 *CELL#2 *
CRUISNUM N= * 3 * 4 *
RECORDS = * 77 * 51 *
N= * 25.6667* 12.7500*
SD= * 36.6652* 8.3417*
CYRA N= * 25.6667* 25.5000*
SD= * 36.6652* 16.6833*
*****

```

Example 1. Input Data File (MX76.DAT)

CRUISNUM	LOCATION	CYRA	CRUISNUM	LOCATION	CYRA	CRUISNUM	LOCATION	CYRA	CRUISNUM	LOCATION	CYRA
161001	17181114172	1	163020	06521082032	1	163063	12331103572	1	163063	12331103572	1
161002	17091114222	1	163021	06101082052	1	163064	12401103522	1	163064	12401103522	1
161003	16551114172	1	163022	06381081352	1	163065	12531103422	1	163065	12531103422	1
161004	17291114402	1	163023	06461082202	1	163066	11251105452	1	163066	11251105452	1
161005	16301115052	2	163024	06101080362	1	163067	10201103142	1	163067	10201103142	1
161006	16251115202	2	163025	06121080402	1	163068	11031104142	1	163068	11031104142	1
161007	16111115392	2	163026	06101080432	1	163069	14541117382	2	163069	14541117382	2
161008	16021115502	2	163027	06301080292	1	163070	08501118302	2	163070	08501118302	2
161009	16271115352	2	163028	06031080592	1	163071	08201122102	2	163071	08201122102	2
161010	16261115262	2	163029	06301081122	1	163072	09211123302	2	163072	09211123302	2
161011	16241115332	2	163030	06301081122	1	163073	09181124352	2	163073	09181124352	2
161012	16201116122	2	163031	07341083512	1	163074	09231125052	2	163074	09231125052	2
161013	16171116322	2	163032	07521085412	1	163075	09301125572	2	163075	09301125572	2
161014	15581116282	2	163033	10491090102	1	163076	09371123572	2	163076	09371123572	2
161015	16001116372	2	163034	10071096332	1	163077	10001121482	2	163077	10001121482	2
161016	15591117172	2	163035	08551102562	1	163078	09401125302	2	163078	09401125302	2
161017	16081117102	2	163036	09021103502	1	163079	09241123572	2	163079	09241123572	2
161018	16221117302	2	163037	08581106042	1	163080	08091116072	2	163080	08091116072	2
161019	16051117402	2	163038	09081106422	1	163081	08151117222	2	163081	08151117222	2
161020	15551117202	2	163039	09261107502	1	163082	03121106542	2	163082	03121106542	2
161021	16241116252	2	163040	16051111132	1	163083	1010882	2	163083	1010882	2
161022	16331115492	2	163041	13161103552	1	163084	12421090382	1	163084	12421090382	1
161023	16221115382	2	163042	14061107182	1	163085	0910922	2	163085	0910922	2
161024	16301115392	2	163043	13351111252	1	163086	08511092402	1	163086	08511092402	1
163001	07011078002	1	163044	13201110002	1	163087	09001092302	1	163087	09001092302	1
163002	08551084122	1	163045	13181109462	1	163088	10151140052	2	163088	10151140052	2
163003	09301085562	1	163046	12351110202	1	163089	12041132302	2	163089	12041132302	2
163004	08381088402	1	163047	12351110362	1	163090	08531130212	2	163090	08531130212	2
163005	11271088472	1	163048	14001106452	1	163091	09261129392	2	163091	09261129392	2
163006	08491086492	1	163049	16341111372	1	163092	07311123572	2	163092	07311123572	2
163007	09001086052	1	163050	22331110352	1	163093	10171117082	2	163093	10171117082	2
163008	09141085382	1	163051	22201110472	1	163094	18151117112	2	163094	18151117112	2
163009	09031085322	1	163052	22221110302	1	163095	09021115212	2	163095	09021115212	2
163010	09301085542	1	163053	22231110312	1	163096	08451115302	2	163096	08451115302	2
163011	09201085542	1	163054	22221110412	1	163097	09331115132	2	163097	09331115132	2
163012	07251082442	1	163055	22231110432	1	163098	10021117122	2	163098	10021117122	2
163013	07181082352	1	163056	22251110352	1	163099	10081116062	2	163099	10081116062	2
163014	05001088302	1	163057	22201110302	1	163100	04002094252	2	163100	04002094252	2
163015	04281084262	1	163058	22201110302	1	163101	05052094262	2	163101	05052094262	2
163016	04371082332	1	163059	16311110392	1	163102	05252092332	2	163102	05252092332	2
163017	06171079472	1	163060	12241107072	1	163103	03412092362	2	163103	03412092362	2
163018	06481082002	1	163061	13301107262	1	163104	021311104352	2	163104	021311104352	2
163019	06511082022	1	163062	12301106302	1						

STRATUM NUMBER	CRUISNUM	LOCATION	CYRA	STRATUM NUMBER	CRUISNUM	LOCATION	CYRA	STRATUM NUMBER	CRUISNUM	LOCATION	CYRA	STRATUM NUMBER	CRUISNUM	LOCATION	CYRA
1	161001	17181114172	1	1	163053	22231110312	1	1	163053	22231110312	1	2	161019	16051117402	2
1	161002	17091114222	1	1	163047	12351110362	1	1	163047	12351110362	1	2	161012	16201116122	2
1	161003	16551114172	1	1	163045	13181109462	1	1	163045	13181109462	1	2	161014	15581116282	2
1	161004	17291114402	1	1	163040	16051111132	1	1	163040	16051111132	1	2	161018	16221117302	2
1	163029	06301081122	1	1	163008	09141085382	1	1	163008	09141085382	1	2	161011	16241115332	2
1	163061	13301107262	1	1	163022	06381081352	1	1	163022	06381081352	1	2	161021	16241116252	2
1	163048	14001106452	1	1	163009	09031085322	1	1	163009	09031085322	1	2	161013	16171116322	2
1	163038	09081106422	1	1	163041	13161103552	1	1	163041	13161103552	1	2	161008	16021115502	2
1	163013	07181082352	1	1	163035	08551102562	1	1	163035	08551102562	1	2	161010	16261115262	2
1	163006	08491086492	1	1	163054	2221110412	1	1	163054	2221110412	1	2	161009	16271115352	2
1	163039	09261107502	1	1	163003	09301085562	1	1	163003	09301085562	1	2	161007	16111115392	2
1	163007	09001086052	1	1	163057	22201110302	1	1	163057	22201110302	1	2	163069	14541117382	2
1	163021	06101082052	1	1	163010	09301085542	1	1	163010	09301085542	1	2	197010	09241123572	2
1	163020	06521082032	1	1	163030	06301081122	1	1	163030	06301081122	1	2	197001	08501118302	2
1	163062	12301106302	1	1	163063	12331103572	1	1	163063	12331103572	1	2	197004	09181124352	2
1	163002	08551084122	1	1	163066	11251105452	1	1	163066	11251105452	1	2	197009	09401125302	2
1	163034	10071096332	1	1	163024	06101080362	1	1	163024	06101080362	1	2	197013	03121106542	2
1	163028	06031080592	1	1	163050	22331110352	1	1	163050	22331110352	1	2	197011	08091116072	2
1	163015	04281084262	1	1	163017	06171079472	1	1	163017	06171079472	1	2	197005	09231125052	2
1	163043	13351111252	1	1	163065	12531103422	1	1	163065	12531103422	1	2	197006	09301125572	2
1	163037	08581106042	1	1	163059	16311110392	1	1	163059	16311110392	1	2	197002	08201122102	2
1	163068	11031104142	1	1	163044	13201110002	1	1	163044	13201110002	1	2	197012	08151117222	2
1	163026	06101080432	1	1	163016	04371082332	1	1	163016	04371082332	1	2	197007	09371123572	2
1	163019	06511082022	1	1	163046	12351110202	1	1	163046	12351110202	1	2	197003	09211123302	2
1	163056	22251110352	1	1	163052	22211110302	1	1	163052	22211110302	1	2	197008	10001121482	2
1	163005	11271088472	1	1	163014	05001088302	1	1	163014	05001088302	1	2	206004	09261129392	2
1	163032	07521085412	1	1	163049	16341111372	1	1	163049	16341111372	1	2	206017	02131104352	2
1	163012	07251082442	1	1	163033	10491090102	1	1	163033	10491090102	1	2	206003	08531130212	2
1	163023	06461082202	1	1	163027	06301080292	1	1	163027	06301080292	1	2	206014	05052094262	2
1	163001	07011078002	1	1	197019	09001092302	1	1	197019	09001092302	1	2	206011	10021117122	2
1	163042	14061107182	1	1	197018	08511092402	1	1	197018	08511092402	1	2	206005	07311123572	2
1	163036	09021103502	1	1	197015	10 1088 2	1	1	197015	10 1088 2	1	2	206015	05252092332	2
1	163011	09201085542	1	1	197016	12421090382	1	1	197016	12421090382	1	2	206001	10151140052	2
1	163064	12401103522	1	1	197017	09 1092 2	1	1	197017	09 1092 2	1	2	206010	09331115132	2
1	163031	07341083512	1	2	161017	16081117102	2	2	161017	16081117102	2	2	206012	10081116062	2
1	163055	22231110432	1	2	161006	16251115202	2	2	161006	16251115202	2	2	206016	03412092362	2
1	163058	22201110302	1	2	161016	15591117172	2	2	161016	15591117172	2	2	206006	10171117082	2
1	163004	08381088402	1	2	161024	16301115392	2	2	161024	16301115392	2	2	206002	12041132302	2
1	163025	06121080402	1	2	161005	16301115052	2	2	161005	16301115052	2	2	206013	04002094252	2
1	163051	22201110472	1	2	161015	16001116372	2	2	161015	16001116372	2	2	206007	18151117112	2
1	163018	06481082002	1	2	161023	16221115382	2	2	161023	16221115382	2	2	206009	08451115302	2
1	163067	10201103142	1	2	161020	15551117202	2	2	161020	15551117202	2	2	206008	09021115212	2
1	163060	12241107072	1	2	161022	16331115492	2	2	161022	16331115492	2	2			

```
40,0,'N',125,0,'U'  
40,0,'N',40,0,'U'  
30,0,'S',40,0,'U'  
30,0,'S',90,0,'U'  
3,0,'S',90,0,'U'  
3,0,'S',95,0,'U'  
5,0,'N',95,0,'U'  
5,0,'N',115,0,'U'  
20,0,'N',115,0,'U'  
20,0,'N',125,0,'U'  
999/  
40,0,'N',125,0,'U'  
40,0,'N',180,0,'U'  
40,0,'S',180,0,'U'  
40,0,'S',40,0,'U'  
30,0,'S',40,0,'U'  
30,0,'S',90,0,'U'  
3,0,'S',90,0,'U'  
3,0,'S',95,0,'U'  
5,0,'N',95,0,'U'  
5,0,'N',115,0,'U'  
20,0,'N',115,0,'U'  
20,0,'N',125,0,'U'  
999/
```

Example 2. Jobstream Output

OUTPUT FROM EVOLVE.FOR;1 (SUBROUTINE PLANIT.FOR;1) AT 25-MAR-81 09:12:10 PAGE 1

*****PARAMETER RECORDS*****

INDATA CRSP76

OUTDATA CRSP02.DAT

OUTPARAMETERS PARCSP02.DAT

STRATA 1 CAPACITY 7-10

RANGE 1 500-800 801-1000 1001-1200 1800-2000

STRATA 2 BEARTYPE 20-20

RANGE 2 1-5 6-6

STRATA 3 CLASS 15-15

RANGE 3 1-1 2-2 3-3

ALL SYSTEMS GO

*****ERROR MESSAGES*****

Example 2. Jobstream Output (continued)

OUTPUT FROM EVOLVE.01

AT 25-MAR-81 09:12:50 PAGE 2

READY TO DO IT

RECORDS READ = 75 RECORDS OUTPUT = 61

14 RECORDS FELL OUTSIDE STRATA 1(CAPACITY) RANGES

0 RECORDS FELL OUTSIDE STRATA 2(GEARTYPE) RANGES

0 RECORDS FELL OUTSIDE STRATA 3(CLASS) RANGES

READY TO SORT IT

STRATIFYING VARIABLE: CAPACITY	1	2	3	4
RANGE:	500-800	801-1000	1001-1200	1800-2000

STRATIFYING VARIABLE: GEARTYPE	1	2
RANGE:	1-5	6-6

STRATIFYING VARIABLE: CLASS	1	2	3
RANGE:	1-1	2-2	3-3

READY TO VIEW IT

OUTPUT FROM EVOLVE.01 (SUBROUTINE VIEWIT.01)

AT 25-MAR-81 09:13:34 PAGE 3

```

STATISTICS BY RECORD
FOR THE FOLLOWING ARRAY, CLASS      = 2-2
CELL NUMBER = ABC  WHERE A = CAPACITY  B = GEARTYPE  C = CLASS

* CAPACITY
GEARTYPE * 500-800 * 801-1000 * 1001-1200 * 1800-2000 *
*****
1-5 *CELL#112 *CELL#212 *CELL#312 *CELL#412 *
RECORDS = * 5 * 3 * 1 * 0 *
*****
6-6 *CELL#122 *CELL#222 *CELL#322 *CELL#422 *
RECORDS = * 0 * 0 * 0 * 0 *
*****

```

OUTPUT FROM EVOLVE.01 (SUBROUTINE VIEWIT.01) AT 25-MAR-81 09:14:17 PAGE 4

STATISTICS BY RECORD
 FOR THE FOLLOWING ARRAY, CLASS = 3-3
 CELL NUMBER = ABC WHERE A = CAPACITY B = GEARTYPE C = CLASS

```

* CAPACITY
GEARTYPE * 500-800 * 801-1000 * 1001-1200 * 1800-2000 *
*****
1-5 *CELL#113 *CELL#213 *CELL#313 *CELL#413 *
RECORDS = * 20 * 6 * 25 * 0 *
*****
6-6 *CELL#123 *CELL#223 *CELL#323 *CELL#423 *
RECORDS = * 1 * 0 * 0 * 0 *
*****
  
```

Example 2. Input Data File (CRSP76)

CAPACITY	CLASS	GEARTYPE
134 1200	3	1
135 800	3	1
136 1100	3	1
137 1000	3	1
138 1200	3	1
139 1100	3	1
140 550	3	1
141 1200	3	1
142 650	3	1
143 650	3	1
144 1200	3	1
145 540	3	1
146 1200	3	1
147 650	3	1
148 1400	3	1
149 1200	3	1
150 370	1	1
151 1200	3	1
152 500	2	1
153 1100	3	1
154 300	1	1
155 270	1	1
156 960	2	1
157 1000	3	1
158 930	2	1
159 1000	3	2
160 520	3	6
161 600	3	1
162 424	2	1
163 1400	3	1
164 1500	3	1
165 550	3	2
166 1050	3	2
167 850	3	2
170 540	3	1
171 1000	3	3
172 600	2	3
173 950	3	1
174 650	3	1
175 750	3	2
176 1200	3	2
177 500	2	1
178 650	3	3

CAPACITY	CLASS	GEARTYPE
179 1200	3	2
180 1082	3	3
181 1036	3	3
182 480	2	1
183 1130	3	2
184 550	3	2
185 750	3	3
186 650	3	1
187 650	3	3
188 1700	3	2
189 1200	3	3
190 600	2	3
191 1200	3	3
192 1500	3	1
193 540	3	1
194 1150	3	3
195 1200	3	2
196 1100	3	1
197 1100	3	1
198 1100	3	2
199 500	2	1
200 780	3	1
201 1100	2	1
202 298	1	1
203 540	3	1
204 1500	3	1
205 1000	2	1
206 650	3	3
208 1700	3	2
209 1100	3	1
210 300	1	1
211 1038	3	1

STRATUM NUMBER	CAPACITY	CLASS	GEARTYPE	STRATUM NUMBER	CAPACITY	CLASS	GEARTYPE
112	172 600	2	3	313	146 1200	3	1
112	199 500	2	1	313	180 1082	3	3
112	177 500	2	1	313	195 1200	3	2
112	152 500	2	1	313	141 1200	3	1
112	190 600	2	3	313	149 1200	3	1
212	158 930	2	1	313	139 1100	3	1
212	205 1000	2	1	313	134 1200	3	1
212	156 960	2	1	313	136 1100	3	1
312	201 1100	2	1	313	189 1200	3	3
113	175 750	3	2	313	183 1130	3	2
113	170 540	3	1	313	179 1200	3	2
113	142 650	3	1	313	153 1100	3	1
113	135 800	3	1	313	191 1200	3	3
113	178 650	3	3	313	176 1200	3	2
113	203 540	3	1	313	144 1200	3	1
113	193 540	3	1	313	194 1150	3	3
113	187 650	3	3	313	198 1100	3	2
113	184 550	3	2	123	160 520	3	6
113	185 750	3	3				
113	143 650	3	1				
113	200 780	3	1				
113	174 650	3	1				
113	147 650	3	1				
113	206 650	3	3				
113	145 540	3	1				
113	165 550	3	2				
113	140 550	3	1				
113	161 600	3	1				
113	186 650	3	1				
213	171 1000	3	3				
213	159 1000	3	2				
213	173 950	3	1				
213	137 1000	3	1				
213	157 1000	3	1				
213	167 850	3	2				
313	209 1100	3	1				
313	181 1036	3	3				
313	211 1038	3	1				
313	196 1100	3	1				
313	197 1100	3	1				
313	151 1200	3	1				
313	138 1200	3	1				
313	166 1050	3	2				

Example 3. Jobstream Output.

OUTPUT FROM EVOLVE.FOR;1 (SUBROUTINE PLANIT.FOR;1) AT 25-MAR-81 09:16:33 PAGE 1

*****PARAMETER RECORDS*****
*****ERROR MESSAGES*****

PASTPARAMETERS PARCSP02

INDATA CRSP02

OUTDATA CRSP03.DAT

OUTPARAMETERS PARCSP03.DAT

COLLAPSE 313C = 313 + 123

COLLAPSE 312C = 312 + 412

REORDER 3 1 2

ALL SYSTEMS 60

Example 3. Jobstream Output (continued).

OUTPUT FROM EVOLVE.01

AT 25-MAR-81 09:17:09 PAGE 2

READY TO DO IT

RECORDS READ = 61 RECORDS OUTPUT = 61

READY TO SORT IT

COLLAPSING FORMULAS: 313C = 313 + 123
312C = 312 + 412

STRATIFYING VARIABLE: CAPACITY 1 2 3 4
RANGE: 500-800 801-1000 1001-1200 1800-2000

STRATIFYING VARIABLE: GEARTYPE 1 2
RANGE: 1-5 6-6

STRATIFYING VARIABLE: CLASS 1 2 3
RANGE: 1-1 2-2 3-3

READY TO VIEW IT

Example 3. Jobstream Output (continued).

AT 25-MAR-81 09:17:45 PAGE 3

OUTPUT FROM EVOLVE.01 (SUBROUTINE VIEWIT.01)

STATISTICS BY RECORD
FOR THE FOLLOWING ARRAY, GEARTYPE = 1-5
CELL NUMBER = ABC WHERE A = CAPACITY B = GEARTYPE C = CLASS

```
* CLASS
CAPACITY * 1-1 * 2-2 * 3-3 *
*****
500-800 *CELL#111 *CELL#112 *CELL#113 *
RECORDS = * 0 * 5 * 20 *
*****
801-1000 *CELL#211 *CELL#212 *CELL#213 *
RECORDS = * 0 * 3 * 6 *
*****
1001-1200 *CELL#311 *CELL#312 C *CELL#313 C *
RECORDS = * 0 * 1 * 26 *
*****
1800-2000 *CELL#411 *CELL#412 *CELL#413 *
RECORDS = * 0 * *COLLAPSED TO* 0 *
*****
CELL#312 C
*****
```

Example 3. Output Data File (CRSP03.DAT)

STRATUM NUMBER	CAPACITY	CLASS	GEARTYPE	STRATUM NUMBER	CAPACITY	CLASS	GEARTYPE
112	172 600	2	3	313	C 149 1200	3	1
112	152 500	2	1	313	C 136 1100	3	1
112	190 600	2	3	313	C 195 1200	3	2
112	177 500	2	1	313	C 189 1200	3	3
112	199 500	2	1	313	C 191 1200	3	3
113	140 550	3	1	313	C 144 1200	3	1
113	200 780	3	1	313	C 179 1200	3	2
113	147 650	3	1	313	C 180 1082	3	3
113	175 750	3	2	313	C 197 1100	3	1
113	193 540	3	1	313	C 181 1036	3	3
113	161 600	3	1	313	C 141 1200	3	1
113	174 650	3	1	313	C 166 1050	3	2
113	206 650	3	3	313	C 139 1100	3	1
113	184 550	3	2	313	C 183 1130	3	2
113	187 650	3	3	313	C 153 1100	3	1
113	186 650	3	1	313	C 194 1150	3	3
113	170 540	3	1	313	C 211 1038	3	1
113	143 650	3	1	313	C 134 1200	3	1
113	178 650	3	3				
113	185 750	3	3				
113	165 550	3	2				
113	135 800	3	1				
113	142 650	3	1				
113	145 540	3	1				
113	203 540	3	1				
212	158 930	2	1				
212	156 960	2	1				
212	205 1000	2	1				
213	159 1000	3	2				
213	173 950	3	1				
213	157 1000	3	1				
213	167 850	3	2				
213	171 1000	3	3				
213	137 1000	3	1				
312	C 201 1100	2	1				
313	C 209 1100	3	1				
313	C 198 1100	3	2				
313	C 196 1100	3	1				
313	C 176 1200	3	2				
313	C 160 520	3	6				
313	C 138 1200	3	1				
313	C 151 1200	3	1				
313	C 146 1200	3	1				

Example 4. Jobstream Output.

OUTPUT FROM EVOLVE.FOR;1 (SUBROUTINE PLANIT.FOR;1) AT 25-MAR-81 09:20:17 PAGE 1

*****PARAMETER RECORDS*****
*****ERROR MESSAGES*****

PASTPARAMETERS PARCSP02

INDATA CRSP02

OUTDATA CRSP05

OUTPARAMETERS PARCSP05

CLUSTER CRUISNUM 3-5

STRATA 1 CAPACITY 7-10

RANGE 1 500-1000 1001-1200

STRATA 2 GEARTYPE 20-20

RANGE 2 1-6

STRATA 3

VARIABLE CLASS 14-15

STATISTICS BY RECORD MEAN STANDARD DEVIATION

STATISTICS BY CLUSTER MEAN STANDARD DEVIATION

ALL SYSTEMS 60

Example 4. Jobstream Output (continued).

OUTPUT FROM EVOLVE.01

AT 25-MAR-81 09:21:09 PAGE 2

READY TO DO IT

RECORDS READ = 61 RECORDS OUTPUT = 61

0 RECORDS FELL OUTSIDE STRATA 1(CAPACITY) RANGES

0 RECORDS FELL OUTSIDE STRATA 2(GEARTYPE) RANGES

READY TO SORT IT

STRATIFYING VARIABLE: CAPACITY 1 2
RANGE: 500-1000 1001-1200

STRATIFYING VARIABLE: GEARTYPE 1
RANGE: 1-6

READY TO VIEW IT

Example 4. Jobstream Output (continued).

OUTPUT FROM EVOLVE.01 (SUBROUTINE VIEWIT.01)

AT 25-MAR-81 09:21:42 PAGE 3

```

STATISTICS BY RECORD
FOR THE FOLLOWING ARRAY,
  CELL NUMBER = ABO  WHERE A = CAPACITY  B = GEARTYPE

  * CAPACITY
  GEARTYPE * 500-1000 * 1001-1200 *
  *****
  1-6 *CELL#110 *CELL#210 *
  RECORDS = * 35 * 26 *
  N= * 35 * 26 *
  CLASS N= * 2.7714* 2.9615*
  SD= * 0.4260* 0.1961*
  *****

```

Example 4. Jobstream Output (continued).

AT 25-MAR-81 09:22:25 PAGE 4

OUTPUT FROM EVOLVE.01 (SUBROUTINE VIEWIT.01)

STATISTICS BY CLUSTER(CRUISNUM)
FOR THE FOLLOWING ARRAY,
CELL NUMBER = A80 WHERE A = CAPACITY B = GEARTYPE

```
* CAPACITY
GEARTYPE * 500-1000 * 1001-1200 *
*****
1-6 *CELL#110 *CELL#210 *
CRUISNUM N= * 35 * 26 *
RECORDS = * 35 * 26 *
M= * 1.0000* 1.0000*
SD= * 0.0000* 0.0000*
CLASS M= * 2.7714* 2.9615*
SD= * 0.4260* 0.1961*
*****
```

Example 4. Output Data File (CRSP05)

STRATUM NUMBER	CRUISNUM	CAPACITY	CLASS	GEARTYPE	STRATUM NUMBER	CRUISNUM	CAPACITY	CLASS	GEARTYPE
110	135	800	3	1	210	151	1200	3	1
110	137	1000	3	1	210	153	1100	3	1
110	140	550	3	1	210	166	1050	3	2
110	142	650	3	1	210	176	1200	3	2
110	143	650	3	1	210	179	1200	3	2
110	145	540	3	1	210	180	1082	3	3
110	147	650	3	1	210	181	1036	3	3
110	152	500	2	1	210	183	1130	3	2
110	156	960	2	1	210	189	1200	3	3
110	157	1000	3	1	210	191	1200	3	3
110	158	930	2	1	210	194	1150	3	3
110	159	1000	3	2	210	195	1200	3	2
110	160	520	3	6	210	196	1100	3	1
110	161	600	3	1	210	197	1100	3	1
110	165	550	3	2	210	198	1100	3	2
110	167	850	3	2	210	201	1100	2	1
110	170	540	3	1	210	209	1100	3	1
110	171	1000	3	3	210	211	1038	3	1
110	172	600	2	3					
110	173	950	3	1					
110	174	650	3	1					
110	175	750	3	2					
110	177	500	2	1					
110	178	650	3	3					
110	184	550	3	2					
110	185	750	3	3					
110	186	650	3	1					
110	187	650	3	3					
110	190	600	2	3					
110	193	540	3	1					
110	199	500	2	1					
110	200	780	3	1					
110	203	540	3	1					
110	205	1000	2	1					
110	206	650	3	3					
210	134	1200	3	1					
210	136	1100	3	1					
210	138	1200	3	1					
210	139	1100	3	1					
210	141	1200	3	1					
210	144	1200	3	1					
210	146	1200	3	1					
210	149	1200	3	1					

